Water

P.E.I.'s MOST PRECIOUS RESOURCE

BOUGHTON - FORTUNE RIVERS COMPLEX

WATERSHED ACTIVITIES

SURFACE WATER PROGRAM

MARCH 1990

THE CANADA—PRINCE EDWARD ISLAND
WATER MANAGEMENT AGREEMENT

Environment Canada Environnement Canada

Prince Edward Island
Department of the Environment

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BOUGHTON - FORTUNE RIVERS COMPLEX

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WATER MANAGEMENT AGREEMENT

Prepared by:

Environment Canada
Inland Waters Directorate
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P.E.I. Department of the Environment
Fish and Wildlife Branch

SURFACE WATER PROGRAM

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PREFACE

This report is one of a series produced as a result of the Canada - Prince Edward Island Water Management Agreement. The work was performed as part of the Watershed Inventory Project under the Surface Water Program.

It was initiated in order to gain a better understanding of the activities which may impact on the quality and quantity of surface waters drained by the Boughton and Fortune Rivers.

The report is intended to be used in conjunction with the report entitled "Activities Affecting Surface Water Resources · A General Overview" and the book of "Boughton - Fortune Rivers Watershed Complex Inventory Maps" which is maintained on file at Inland Waters Directorate, Environment Canada in Dartmouth, Nova Scotia. All references to maps in the report are to the atlas.

Mapping was performed on the 1:50,000 N.T.S. topographical series using the Universal Transverse Mercator (U.T.M.) grid system to the nearest one hundred (100) metres for point data. Non-point (polygon) data is also mapped where applicable. This mapping technique is easily transferable to the Geographical Information System (G.I.S.) which provides for updating and manipulation of the data.

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1.0 INTRODUCTION

In November 1987, the Canada - Prince Edward Island Water Management Agreement was signed. The Agreement focuses upon several areas including groundwater contamination, surface water degradation and estuarine eutrophication. Of these, the Watershed Inventory Project, as part of the Surface Water Program, has been designed to identify current and future users of surface water and to document resource conflicts within twelve watersheds across the province. The Boughton - Fortune Rivers Watershed Complex (Figure 1.1) was identified as an area of study for the project.

2.0 GENERAL CHARACTERISTICS OF THE BOUGHTON - FORTUNE RIVERS WATERSHED COMPLEX

2.1 Physiography

The several glaciers which at one time covered Prince Edward Island have caused a gently undulating terrain across much of the province. Average elevation is less than sixty-one (61) metres above sea level. The Boughton - Fortune Rivers Watershed Complex encompasses one of the gently rolling sections of the Island with maximum elevations only just exceeding the Island average.

The Boughton - Fortune Rivers Watershed Complex is located in the northeastern part of Kings County, P.E.I. The Boughton and Fortune Rivers each drain a number of tributaries with the Boughton River then emptying into Boughton Bay and the Fortune River emptying into Rollo Bay. Boughton Bay and Rollo Bay, which are separated by Howe Point, Durell Point and Cape Spry, then open into the Northumberland Strait.

The watershed drains a land base of one hundred and eighty-one square kilometres (181 km^2) through approximately one hundred and fifty-one kilometres (150.8 km) of rivers and streams. A physiographic comparison with Prince Edward Island (Figure 2.1) reveals that the watershed, as a whole, has more forested and less cleared land (Taylor, 1988). This is more pronounced in the Fortune River subwatershed which has almost three-quarters of its land devoted to woodlands. Estuaries compose 9% of the total area of the Boughton River subwatershed.

The area is sparsely populated with fishing villages located along the shoreline and hamlets scattered throughout. As is the case with the Island as a whole the watershed is traversed by an extensive network of roads. Many of these roads are unpaved and are not kept open during the winter months.

Although the land is mostly wooded and fairly marshy by

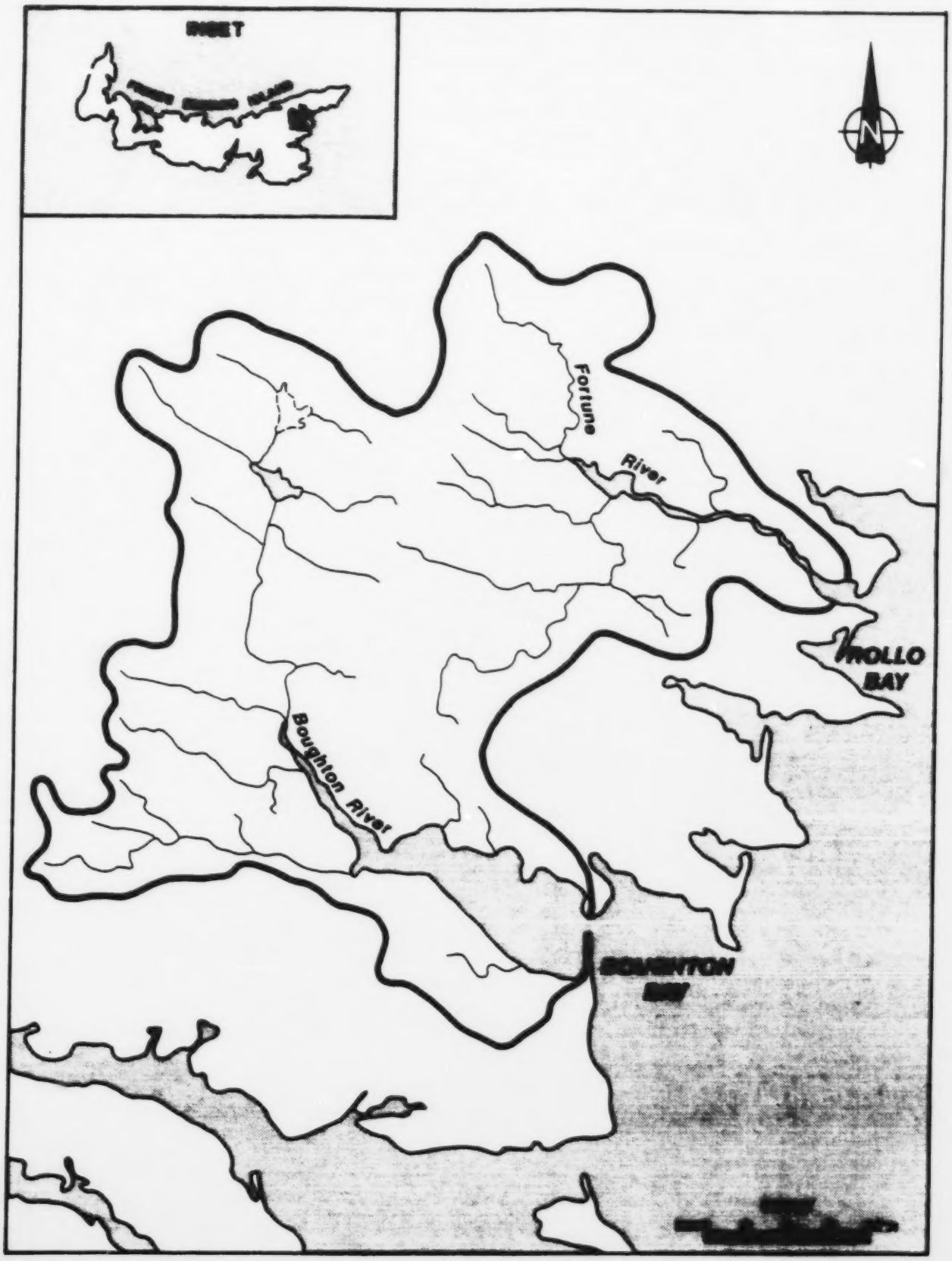

Figure 1.1 Boughton — Fortune Rivers Watershed Complex

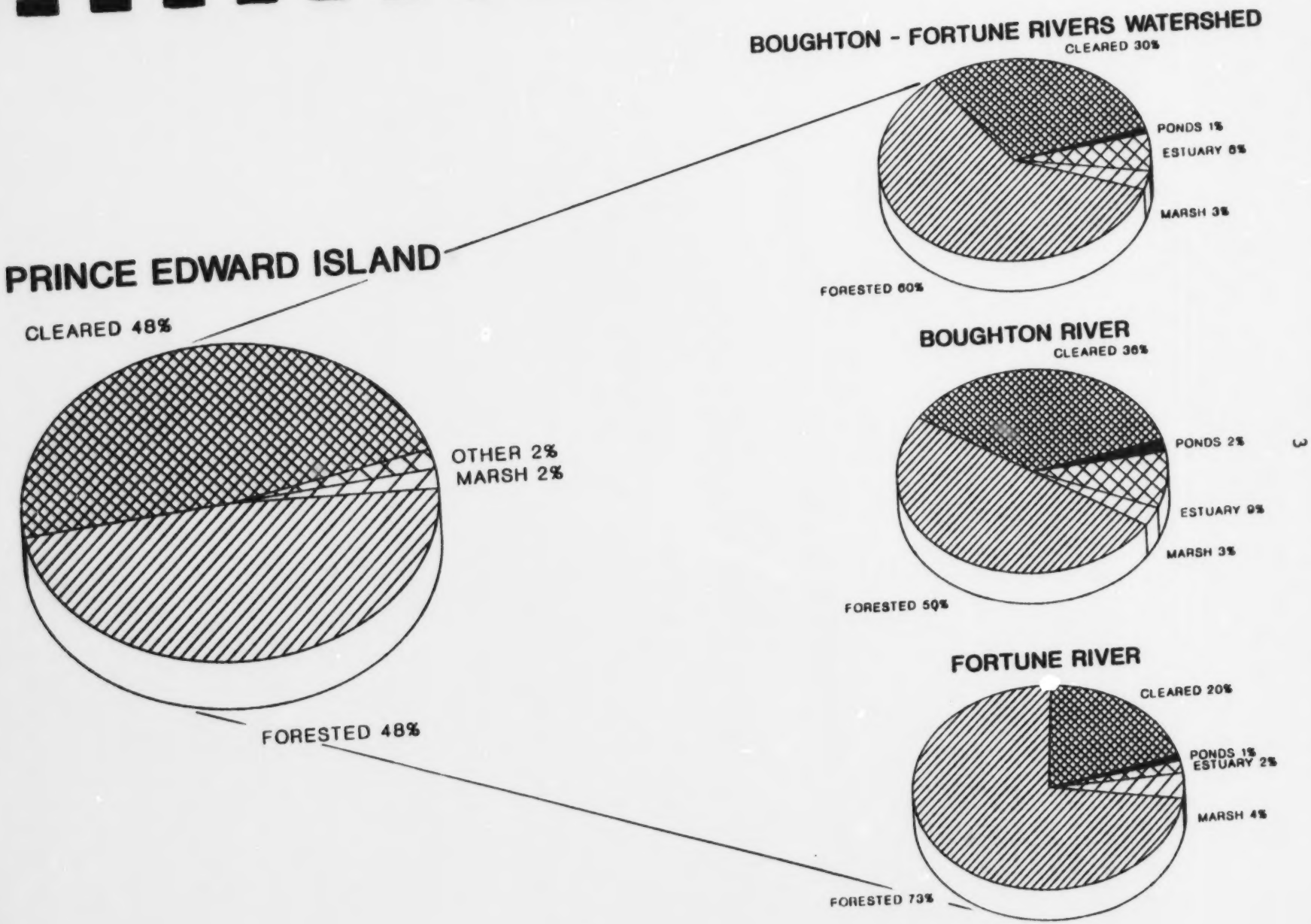

Figure 2.1 Physiographic Comparison Between Prince Edward Island and the Boughton — Fortune Rivers Watershed Complex

Island standards, it is good for agriculture in those areas which are not too wet or too steep. Although Prince Edward Island is an agriculture-intensive province, the Boughton - Fortune Rivers Watershed Complex is not extensively farmed. However, there are several livestock operations located within the watershed.

2.2 Soils

Prince Edward Island's podzol soils, formed mainly from the weathering of sandstone, are generally stone-free, sandy and permeable. The Boughton - Fortune Rivers Watershed Complex is composed of varying amounts of Class 0, 2S, 3S, 3T, 4S, 4T, $5^{*}w$, 5T, 5W, 7I and 7W soils. Approximately five percent (5%) of the soils are Class 0, thirty-five percent (35%) Class 2, ten percent (10%) Class 3, ten percent (10%) Class 4 and thirty-five percent (35%) Class 5. Less than five percent (5%) of the soils are characterized as Class 7 (Canada Land Inventory, 1968).

3.0 AGRICULTURAL OPERATIONS

Despite the fact that agriculture forms a major part of Prince Edward Island's economy, the Boughton - Fortune Rivers Watershed Complex's terrain is generally not well-suited for crop production. Agricultural activities (Maps 11L/7 and 11L/8) center around the raising of livestock and fodders.

3.1 Dairy Operations

There are fourteen dairy operations located within the watershed (Figure 3.1) each containing thirty (30) or more head (30 milkers and 30 feeders) of cattle (Sutherland, 1989).

3.2 Beef (Feedlot) Operations

There are five beef cattle operations (Figure 3.1) with fifty (50) or more head (50 cattle plus 50 feeders) present within the Boughton - Fortune Rivers Watershed Complex (Sutherland, 1989).

3.3 Hog Operations

There are seven hog operations (Figure 3.1) located within the boundaries of the Boughton River subwatershed. No such operations exist within the Fortune River subwatershed. Each has an annual production of eight hundred (800) or more animals (Sutherland, 1989). Since hogs are normally housed indoors the only threats to the quality of surface waters are as a result of the improper storage and disposal of manure.

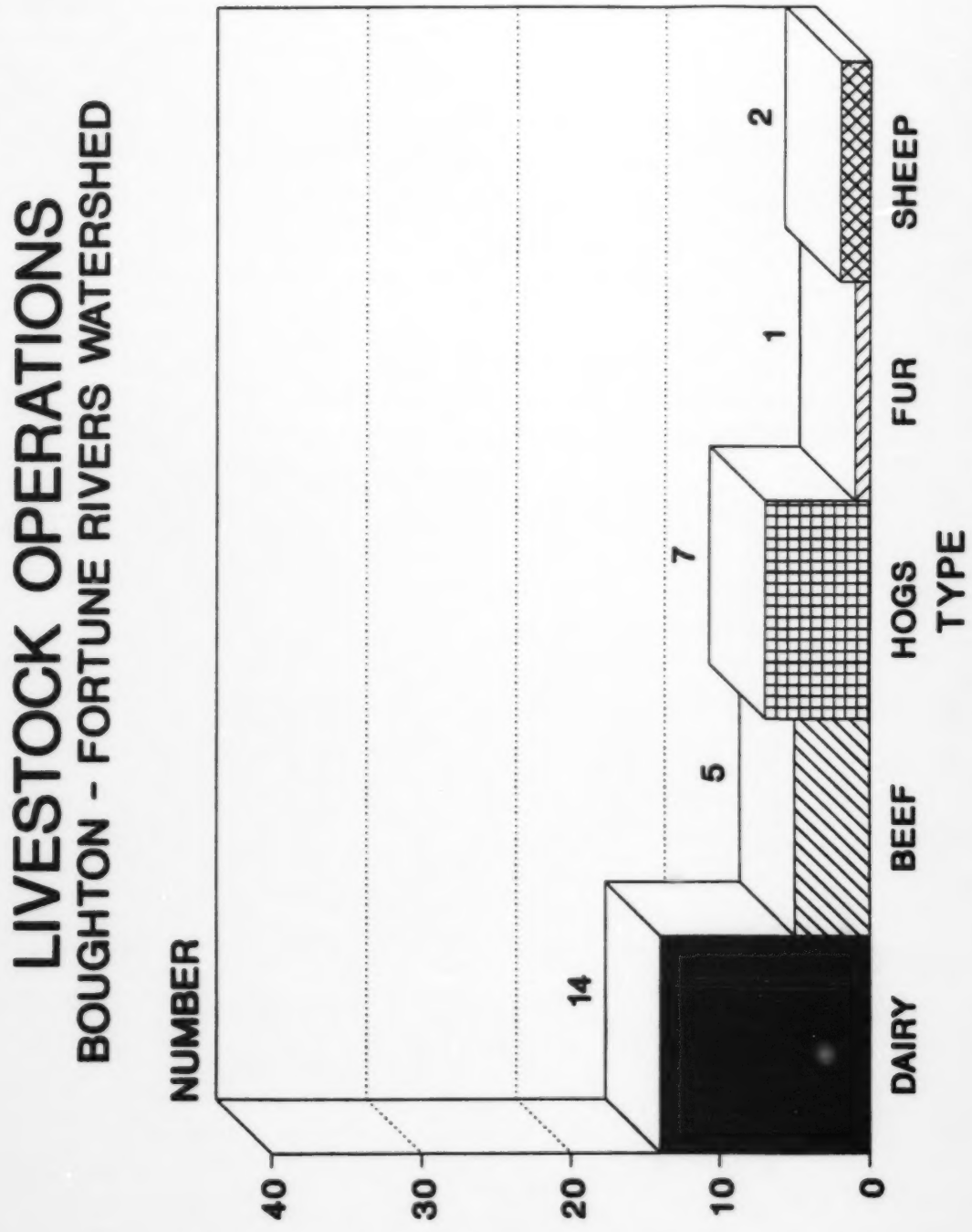

Figure 3.1 Livestock Operations Located Within the Boughton — Fortune Rivers Watershed Complex

3.4 Sheep Operations

There are two sheep operations of significant size (Figure 3.1) located within the Boughton River subwatershed Complex (Sutherland, 1989).

3.5 Fox Operations

There is one fox ranch (Figure 3.1) of noteable size. It is located within the Fortune River subwatershed (Sutherland, 1989).

3.6 Stock Watering

Most livestock on Prince Edward Island are watered from groundwater after it has been piped into a trough (Murphy, S., 1988). However, there have been instances noted within the Boughton - Fortune Rivers Watershed Complex in which animals were observed drinking from streams traversing pastures (refer to Section 11.1). This results in destabilization of the stream banks, siltation and bacterial contamination of the water.

3.7 Irrigation

The Prince Edward Island Department of Agriculture does not keep specific records on irrigation occurring within the province. Water used for irrigation generally comes from a surface water source such as a farm pond or stream. During unusally dry years, there are probably more farmers than usual who have to irrigate (Clough, 1988). This activity may have an effect on the amount of water available for users downstream of the withdrawal location. Therefore, a monitoring system should be in place so as not to jeopardize the resource.

3.8 Dead Stock Burial

There are no dead stock burial sites located within the Boughton - Fortune Rivers Watershed Complex. Farmers can pay a service fee to have their stock discarded at an approved disposal site or they can sell their dead animals to Maritime Pet Foods. Both are located outside of the watershed. They can also dispose of the animals on their own land (which is the most likely scenario).

3.9 Erosion Control Projects

There are two erosion control projects located within the watershed (Map 11L/8). One is an open ditch and the other is a tile drainage project (Pharo, 1988). Tile drainage projects enable farmers to convert nonproductive lands into more productive lands (DeHaan, 1989).

4.0 FISH AND WILDLIFE RESOURCES

Fish and wildlife resources are important to both residents and tourists alike on Prince Edward Island in terms of the recreational and economic benefits they provide. Fish and wildlife on P.E.I. are dependent upon surface water resources either for primary habitat or as a source of drinking water.

4.1 Angling Areas

There are numerous angling sites located along the river banks within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8) including four listed in Angling on Prince Edward Island (P.E.I. Department of Tourism and Parks, 1988). The most frequented angling locations have been delineated by the P.E.I. Fish and Wildlife Conservation Officer responsible for the area (MacIntyre, 1989).

4.2 Hunting Areas

The entire watershed is an excellent area for hunting waterfowl (MacIntyre, 1988). The numerous wetlands provide feeding and resting areas for waterfowl during their annual migrations. As well, the extensive wooded areas provide habitat for upland game such as snowshoe hare and ruffed grouse. Other game hunted within the area include Hungarian partridge, snipe and woodcock. Since wildlife is known to be migratory, in response to habitat requirements and food availability, their boundaries are not static from year-to-year.

4.3 Trapping Areas

As with hunting areas, the trapping areas located within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8) do not have consistent boundaries from year-to-year. They are dependent both upon the movement of animals and the preferences of trappers. Species trapped include beaver, muskrat, fox, mink and raccoon (MacIntyre, 1989).

4.4 Beaver Activity Areas

Beaver-built dams result in the creation of flowages which can supply additional habitat for other types of wildlife species such as waterfowl, mink and muskrat but can also affect the quality of habitat for other species (pheasants, grouse and snowshoe hare) and the ability of finfish species to pass through the site on their way to upstream or downstream areas. There are forty-seven (47) known beaver activity areas located within the watershed (Maps 11L/1, 11L/7 and 11L/8), (Dibblee, 1989).

5.0 RECREATIONAL ACTIVITIES

Surface water and some recreational activities go hand-in-hand (swimming and boating). Other activities (hiking and skiing) are often enjoyed in close proximity to streams and rivers. Similarly, major recreational facilities (provincial parks and campgrounds) are generally situated adjacent to Island surface water resources.

5.1 Provincial Parks / Private Campgrounds

There are not any provincial parks located within the Boughton - Fortune Rivers Watershed Complex. Boughton River Park, a community park located in Bridgetown (Map 11L/7), offers picnicking and playground facilities.

There are no private camping areas located within the watershed's boundaries although there are six accommodation's (bed and breakfast and motel) facilities.

5.2 Swimming Areas

Generally people will swim where they desire. In P.E.I., many of the best swimming areas are coastal. This excludes most of the Boughton - Fortune Rivers Watershed Complex.

The only organized swimming activities on the Island occur through the Canadian Red Cross Society which does not conduct swimming events in the Boughton - Fortune Rivers Watershed Complex. The wider sections of the Boughton and Fortune Rivers, areas near bridges and ponds would most likely be frequented by swimmers.

5.3 Boating / Canoeing Areas

Despite the attractiveness of the Boughton and Fortune Rivers for boating and canoeing launching sites are limited. Most power boats enter the Boughton or Fortune Rivers from public launching ramps located at fishing wharves near the mouths of the Rivers. There is a paved launching site in Bridgetown (Map 11L/7) providing access to the Boughton River and there is also a paved boat launch which enables access to the pond at Forest Hill. Deeper draft sailing boats cannot enter the shallow Rivers.

The Prince Edward Island Recreational Canoeing Association is able to provide additional information on various canoeing routes throughout the province but does not offer any organized trips. The Boughton River is suitable for canoeing from Chapel Point to the first bridge north of Bridgetown (Map 11L/7) while the Fortune River offers good canoeing from Dingwells Mills to Fortune Bridge (Map 11L/8). Whitlocks Pond offers canoeing through some of the open water channels traversing the management area (P.E.I. Department of Tourism and Parks, n.d.).

Boardsailing is gaining popularity on P.E.I. The large size of the estuarial portions of the Boughton and Fortune Rivers, which open to the larger Bays and then to the Northumberland Strait, provide the area for most of the windsurfing activity.

5.4 Hiking / Cross-Country Skiing / Snowshoeing

For the nature-buff or recreational enthusiast, a good method in which to see an area is on foot, either by hiking, cross-country skiing or snowshoeing. In this way, people can go at their own pace, perhaps photographing what catches their eye or just enjoying the great outdoors.

There are no organized hiking or cross-country trails within the Boughton - Fortune Rivers Watershed Complex although trails on private lands and rail lines are used by hikers and skiers.

Snowshoeing activities may be undertaken anywhere within the watershed. However, the areas utilized for hiking and cross-country skiing most likely have the highest use for snowshoers as well.

5.5 Snowmobiling / Horseback Riding

There are not any snowmobiling clubs located within the watershed and therefore, no large organized excursions. Snowmobilers are often observed riding through fields and along woods' and seasonal roads.

There are not any commercial horseback riding operations located within the Boughton - Fortune Rivers Watershed Complex. However, there have been horses noted in pastures. It has, therefore, been assumed that horseback riding does occur on a limited scale within the watershed.

5.6 Unplowed (Seasonal / Scenic Heritage) Roads

Many local and unimproved roads within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8) are not open for vehicular traffic during the winter months. The relative abundance of such roads within the watershed provides excellent facilities for winter recreational activities such as cross-country skiing, snowshoeing and snowmobiling. Often not well travelled, even during the warmer months, these roads may further supply recreational opportunities for hiking, cycling and horseback riding.

Some roads across the Island have been designated as Scenic Heritage Roads as a result of their natural and historical significance. There have not been any roads so designated within the watershed (Horne et. al., 1988).

6.0 FISHERIES OPERATIONS

The fishing industry is very important to the economy of Prince Edward Island. All major watersheds have an estuarial component thereby supporting a fishery to some extent. The Boughton River estuary is especially concentrated with a large amount of inshore fishing activity and fishing shacks near Launching Point (Map 11L/1). All finfish and shellfish harvesting conducted within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1 and 11L/8) can be placed into three broad categories, namely; licensed commercial, non-licensed commercial / recreational and finfish aquaculture.

6.1 Licensed Commercial

Some sections of the Boughton River and Fortune River estuaries are classed as public fishing domain. As such, there are no suspended or ground shellfish leases and any fisherman can remove shellfish in season. Other areas are specific leased areas or zones and can be fished only by the lease owner. There are eleven mussel leases, three oyster leases and one finfish lease operational within the watershed (Maps 11L/1 and 11L/8), (Small, 1989).

The primary public oyster harvesting areas in the Boughton - Fortune Rivers Watershed Complex are indicated in Maps 11L/1, 11L/7 and 11L/8. Quahogs and soft-shelled clams are also harvested in the Rivers on both a commercial and non-commercial basis.

The Boughton - Fortune Rivers Watershed Complex is open to eel netting annually from August 15 to November 30. The entire system is open to eel spearing on a year round basis. Concern is being expressed in some areas over the depletion of eel stocks. Box nets are used to trap smelt during the annual season (October to February). Smelt catches are regulated by season and are monitored by Department of Fisheries and Oceans personnel. Since the scaling down of the seal hunt, concern has been expressed about the negative impact of the seals feeding on smelts as they migrate into the watershed. The gaspereau fishery is carried out only at the Dingwells Mills Bridge (MacKinnon, 1989).

The value of the fish and shellfish landed within the watershed are shown in Figure 6.1. Shellfish concentrations within the Boughton River and Fortune River estuaries have also been identified by Department of Fisheries and Oceans staff (Maps 11L/1, 11L/7 and 11L/8).

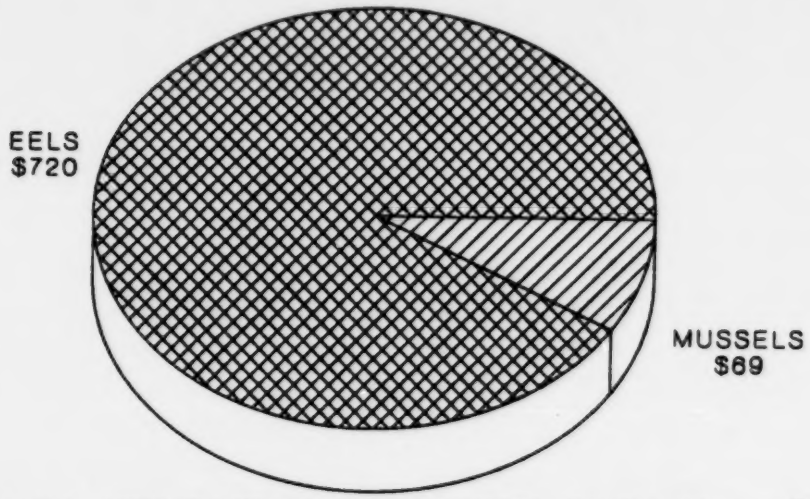

Figure 6.1 1987 Fish/Shellfish Landings Within the Boughton — Fortune Rivers Watershed Complex

6.2 Non-Licensed Commercial / Recreational

Trout, salmon and smelt are harvested in season for personal consumption and some mackerel are taken at the mouths of the Rivers. Quahogs, clams and mussels are also harvested from public areas.

Despite the closure of parts of the Boughton River and Fortune River estuaries due to bacterial contamination (Map 11L/8), they currently support significant non-licensed commercial and recreational finfish and shellfish harvests. The shellfish which are removed from the contaminated areas, must be transferred to unpolluted areas for flushing (a period of three to four weeks). However, people who harvest shellfish from contaminated areas must first obtain a conditional permit from the Department of Fisheries and Oceans. Bar clams are also harvested near the mouth of the Fortune River.

6.3 Finfish Aquaculture

The Boughton - Fortune Rivers Watershed Complex contains three finfish aquaculture operations. All are sea cage set-ups containing rainbow trout and/or Atlantic salmon. The Boughton River operation has 2000 trout and 1500 salmon. The Fortune River operations contain 20,000 rainbow trout and 1000 rainbow trout, respectively. No waste retention or treatment systems are in place at any of the sites (Murphy, L., 1989).

7.0 INDUSTRIAL OPERATIONS

Many of the industrial operations on Prince Edward Island have an effect on surface water resources in one way or another. Some discharge both treated and untreated wastes directly into streams and rivers while others may unknowingly

allow for the seepage of pollutants to surface water or ground water sources. Some industrial operations require surface water for their processes.

7.1 Stormwater Drainage

There are no stormwater drainage systems within the watershed. The municipalities in the area are fairly small and the stormwater and snowmelt is run off into ditches (Mills, 1989).

7.2 Sewage Treatment Plants / Lagoons

There are not any sewage treatment plants or lagoons located within the Boughton - Fortune Rivers Watershed Complex. Sewage is treated by individually installed septic systems (Mills, 1989).

7.3 Abandoned, Active and Unapproved Dump Sites

During 1982-83 the P.E.I. Department of Community and Cultural Affairs, in conjunction with Environment Canada, performed a study in which abandoned, active and unapproved waste disposal sites on Prince Edward Island were located and inspected (Water Resources Section, 1983). Of prime concern during the Inventory was the potential for groundwater contamination. A total of nineteen (19) sites were identified within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8).

As part of the Inventory, a scoring system was used to rate and priorize (Priority I, II and III) each site on the basis of actual and potential environmental effects. Priority I sites were rated as being most hazardous to the environment; Priority II dumps were less hazardous; while Priority III sites were generally very small discriminate sites which were not considered to be environmentally hazardous. Evaluation of the abandoned sites revealed no Priority I sites, five Priority II sites and fourteen Priority III sites within the watershed.

The Air and Solid Wastes Branch, P.E.I. Department of the Environment, has identified three active dump sites in which they are actively involved in operating (Maps 11L/7 and 11L/8). Two are located within the Boughton River subwatershed (St. Georges and Upton) while the third is located in the Fortune River subwatershed at Dingwells Mills (Curley, 1989).

There is no established program for hazardous waste disposal on Prince Edward Island (Curley, 1988). However, the Air and Solid Wastes Branch cooperates with their federal counterparts in controlling toxic waste disposal. For example, asbestos, which has been removed from buildings is double-bagged and dumped at landfill sites. Agricultural

pesticides are sometimes left at dumpsites illegally. Since it is difficult to regulate such practices remnant chemicals could become a potential hazard to both surface and groundwater resources.

The only other major form of toxic wastes on P.E.I. are polychlorinated biphenols (PCB's). As these compounds do not break down under normal conditions, they must be stored until they can be transported to a proper disposal site (located off-Island). There are not any registered PCB-user or storage sites located within the Boughton - Fortune Rivers Watershed Complex (Guardian - Patriot, 1988).

7.4 Excavation Pits

Scattered throughout Prince Edward Island are numerous excavation pits used for the private and commercial removal of sandstone, and to lesser amounts, gravel and sand. A total of seven registered excavation pits (Maps 11L/7 and 11L/8) are active within the watershed. Records are not kept concerning the quantity of material removed from the individual pits and there are other pits for which permits have not been obtained. As well, records are not maintained concerning the number of non-operational or abandoned pits (Murphy, C., 1988).

7.5 Salt / Sand Storage Locations

The P.E.I. Department of Transportation and Public Works maintains a number of salt/sand storage areas across the Island. At these temporary sites, the salt and sand is stored directly on the ground with little or no site preparation. Often, the locations of these secondary sites change thereby yielding both abandoned and active sites. Three active sites (Bridgetown, Upton (Map 11L/7) and Dingwells Mills (Map 11L/8)) have been identified. The site in Bridgetown is a permanent enclosed location.

7.6 Snow Disposal Sites

Because of the small size of the communities located within the Boughton - Fortune Rivers Watershed Complex there are no major problems with snow accumulation on streets. Snow is plowed or blown into the ditch. It is not trucked away to specified disposal sites. Therefore, the effects of this activity on surface water resources are minimal (Mills, 1989).

7.7 Additional Industrial Activities

An asphalt plant is located at Dingwells Mills near the Fortune River. The potential for water degradation exists because of the plant's proximity to the river but no incidents have been reported to date.

8.0 ALTERATIONS OF NATURAL FEATURES OF WATERWAYS

Individuals or groups wishing to alter a water system directly or indirectly to improve its recreational potential, to provide a reservoir for agricultural purposes or fire protection or to construct a stream crossing must seek approval from the P.E.I. Department of Community and Cultural Affairs (Environmental Protection Act, Sections 10 and 11).

8.1 Application Process and Requirements

Alteration applications are subject to government control under the P.E.I. Environmental Protection Act (Section 10) and the Canada Fisheries Act (Chapter F-14, Section 20). Before requests are given final approval by the Head of the Watercourse Alteration Advisory Committee, they are reviewed by several Federal/Provincial Government and private agencies. Once approval is granted, inspections are carried out to ensure that the recommendations of the Committee are being followed.

Application considerations include the following criteria: the well-being of the fisheries resource; possible changes in water quality; stream-side cutting leading to loss of essential food and cover for wildlife; and the effects of the alteration on other types of wildlife.

Types of alterations include; installation of dams and/or fishways, bypass pond construction, roadway culvert installation, rock gabion installation and the infilling of marshes. Infilling applications, most often, are rejected since the practice results in a loss of wildlife habitat.

Since P.E.I. soils are highly susceptible to erosion, proponents who alter waterways must undertake erosion control measures throughout the construction process.

8.2 Dam Inspections

There are seventeen (17) dams located within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8), all of which were inspected during the project. Ten dams are located within the Boughton River subwatershed and seven within the Fortune River subwatershed. Descriptions of the dams are contained in Appendix A. Some of the dams were found to constitute a total barrier to fish passage. The reasons for this were due either to the design of the dams, breakdown of the structures or debris within the waterways. Other dams were breached (washed out).

There are, in some cases, repairs made to design flaws of roadway culverts on P.E.I. which then permit the passage of fish through the structures. This may involve the installation of baffles which then allows for decreased flows

and increased depths within the culverts.

8.3 Fishways

On Prince Edward Island, whenever an alteration is made to a waterway, the continued passage of fish must be ensured [Canada Fisheries Act, Chapter F-14, Section 20, (1)]. This involves, in some cases, the construction of a fishway. Various fishway designs are available with the type constructed dependent upon the species of fish to be passed and the water level fluctuations within the impoundment.

Two fishways located within the watershed were identified and field checked. The seven step pool and weir fishway, located near St. Charles (Map 11L/8), was found to be in good condition. The five step pool and weir fishway, located in the Forest Hill area of the Boughton River subwatershed (Map 11L/7), was also observed to be in good condition.

8.4 Road - Stream Intersections

The P.E.I. Department of Transportation and Public Works maintains a reference map which provides an up-to-date record of all major highway structures, that is, those over 1.2 metres in diameter, within the province. The Boughton - Fortune Rivers Watershed Complex contains twenty-one (21) such crossings (Maps 11L/7 and 11L/8).

The Watershed Inventory Project also identified thirty-seven (37) additional road - stream intersections which are not kept on file at the Department of Transportation and Public Works (Maps 11L/1, 11L/7 and 11L/8). These areas were located via 1:50,000 N.T.S. maps but not all will be field checked due to time and manpower constraints.

8.5 Rail - Stream Intersections

Rail transportation on Prince Edward Island is losing out to higher costs and the more efficient method of trucking goods across the province. As a result of this phenomenon, all rail lines across the province were abandoned effective January 1990.

The Boughton - Fortune Rivers Watershed Complex does not contain any rail lines and therefore, will not be subjected to any future problems of instream obstructions due to the cessation of regular inspection and maintenance of rail - stream crossings.

9.0 WETLANDS

Wetlands include salt marshes, intertidal flats, bogs, freshwater marshes, swamps and ponds. They are important for many reasons (Canadian Wildlife Service, n.d.):

1. as wildlife habitat;
2. act as natural filters;
3. bind pollutants thereby slowing the eutrophication process;
4. reduce flooding by acting as reservoirs; and
5. recharge the groundwater supplies.

During 1983 - 84 wetlands over 0.25 hectares on Prince Edward Island were inventoried. The objective of the Program was to provide information on the classification, size, distribution and wildlife value of P.E.I. wetlands.

9.1 Freshwater Wetlands

All freshwater wetlands within Prince Edward Island were identified during the Inventory and were given a wildlife value based on a wide array of parameters. The wetlands received a score between 36 and 108 with a score of 60+ indicating generally more productive areas.

There were a total of thirty (30) freshwater wetlands with a score of 60+ delineated within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/1, 11L/7 and 11L/8). Seventeen are located within the Boughton River subwatershed and thirteen within the Fortune River subwatershed (Canadian Wildlife Service, n.d.).

9.2 Coastal Wetlands

Coastal wetlands were classified and scored as coastal units during the wetland inventory. The coastal unit score was calculated using the total of the scores from six component types of wetlands along with five additional factors. Added to that was a value for the disturbance status of the unit. The total coastal unit score indicated its productivity and provided a measure of its importance to wildlife. The coastal unit scores ranged from 10 to 1500 points and were indicated as the sum of all wetlands within the unit.

There are twelve wetlands which are classified as coastal within the Boughton - Fortune Rivers Watershed Complex (Maps 11L/7 and 11L/8), (Canadian Wildlife Service, n.d.).

9.3 Ducks Unlimited Canada Management Sites

Ducks Unlimited Canada (D.U.) is active on Prince Edward Island in the enhancement and management of wildlife habitat. Several types of management techniques are employed for this purpose. Installation of water control devices such as drop inlets and stoplog control structures allow for the creation of ponds and the regulation of water levels in order to maintain optimal habitat conditions. Fishways are usually installed with the water level control structures in order to

allow for the continued passage of fish into and out of the impoundment.

There are soon to be five active Ducks Unlimited sites located within the Boughton - Fortune Rivers Watershed Complex (Table 9.1). Ducks Unlimited Canada has recently (1989) commenced construction of two impoundments within the newly designated Big Brook Wildlife Management Area (Map 11L/8). An existing D.U. management site, Forest Hill, is also having a second impoundment constructed.

Table 9.1 Ducks Unlimited Canada Management Sites Within The Boughton - Fortune Rivers Watershed Complex

NAME	SIZE (ha)	SHORELINE (km)	YEAR COMPLETED
Forest Hill	180	4.0	1971
Whitlocks Pond	372	3.0	1984
St. Georges	9	1.0	1986
Black Creek	3	0.6	1987

10.0 ADDITIONAL ACTIVITIES WITHIN THE BOUGHTON - FORTUNE RIVERS WATERSHED COMPLEX

10.1 Hydrometric Stations / Water Chemistry Data

The first streamflow data collected in Prince Edward Island was from the Dunk River at Rogers Mill between 1919 and 1935. Currently, there are hydrometric two stations on P.E.I. which have been in operation since 1961. There is one station in the watershed. It (NAQUADAT No. 01CD004) was established on the Boughton River near Upton in 1988.

In addition, the Water Quality Branch, Inland Waters Directorate, Environment Canada, Moncton, New Brunswick also maintains somewhat limited data associated with the following studies:

- P.E.I. Groundwater Study (May 1972 - September 1973);
- P.E.I. Surface Water Quality Survey (July 1972);
- Water Quality Board National Water Quality Monitoring (April 1974 - March 1978); and the
- Toxic Chemical Survey (1985).

Parameters monitored included the following: major ions,

physical parameters, nutrients, metals and toxic substances.

10.2 Forest Hill Wildlife Management Area

The Forest Hill Management Area (Map 11L/7), which contains approximately 350 hectares of woodland along with two major ponds, open fields and a series of roads, is currently undergoing an integrated management plan designed to enhance wildlife and forestry.

Wildlife enhancement activities within the management area involves the creation of habitat through snag (dead or dying) trees and brush and/or rock piles. Forestry prescriptions are being geared towards the production of hardwood or softwood sawlogs. As well, the creation of additional access and sawlog extraction roads will provide trails for such recreational activities as hiking, cross-country skiing and snowmobiling.

10.3 Rollo Bay Wildlife Management Area

Part of the Rollo Bay Wildlife Management Area's 760 hectares is contained within the Fortune River subwatershed (Map 11L/8). The purpose for the creation of the area is to provide fall migration habitat for Canada geese. It is important as a staging area since it is bordered on three sides by ideal upland feeding habitat, that is, mostly grain and potato fields. As well, the estuarial portion of Rollo Bay offers abundant food for the geese. There are often geese overwintering in the ice-free waters within the management area but this is not the primary goal of the management objectives.

10.4 Big Brook Wildlife Management Area

The Province of P.E.I. has recently acquired lands within the Big Brook area of Kings County for use as a wildlife management area (Map 11L/8). The 754 hectares, which includes approximately 200 hectares of wetlands, was acquired through the Eastern Habitat Joint Ventures (E.H.J.V.) Project. The E.H.J.V. is a series of projects designed to enhance black duck habitat, and subsequently populations, along the eastern seaboard of North America.

Management within the Big Brook Wildlife Management Area will be geared primarily towards the creation of nesting and brood rearing habitat for the black duck. Wood duck boxes will also be erected in anticipation of establishing a pioneering population within the area. As well, the extensive upland habitat will enable for the management of such species as woodcock, pheasant and snowshoe hare.

11.0 ACTIVITIES AFFECTING SURFACE WATER RESOURCES WITHIN THE BOUGHTON - FORTUNE RIVERS WATERSHED COMPLEX

Many of the problems affecting surface water resources within the Boughton - Fortune Rivers Watershed Complex occur as a result of the high erodibility of Island soils. Soil erosion is accelerated by poor agricultural, forestry and road maintenance and construction practices. The problems affecting surface water resources on P.E.I. can be placed into three general categories: sedimentation (siltation) sources, pollution point sources and instream obstructions.

11.1 Sedimentation (Siltation) Sources

The entry of soil into surface waterways is described by the Watershed Inventory Project as a sedimentation (siltation) source. Autumn tillage, particularly plowing with the slope and cultivation excessively close to the streams' edge, often results in extensive landwash and siltation of the Island's waterways. Improper forestry operations, such as clearcutting on steep slopes and removal of greenbelts, also provides for the sedimentation of streams and rivers.

One of the major sources of siltation to Island waterways is caused by the construction and maintenance of P.E.I. roads. Many roads on the Island are unpaved which presents numerous potential sources of sedimentation. Improper grading of these roads, in particular, leaving a ridge of clay and sand at either edge allows runoff water to form channels causing erosion to the road surface. Water usually flows alongside these ridges until it "breaks" through, usually at a road-stream intersection. This practice of grading also renders ditches, if present, useless.

Silt-loading of Island streams and rivers does not usually affect the waterway at the point of entry but its effects are impacted further downstream. Soil particles are carried by currents and eventually deposited onto the streambed covering essential finfish spawning areas. As well, shellfish beds within the estuaries at the mouth of the rivers and streams are smothered by the silt that has originated from upstream locations.

11.1.1 Dundas

A clear cut forested area (Map 11L/7) is a potential siltation source to Graystone Creek, a tributary of the Boughton River.

11.1.2 Primrose

A small excavation pit, located above Graystone Creek (Map 11L/7), is a potential siltation source as the slopes are 1:1.

11.1.3 Strathcona

A road-stream intersection (Map 11L/7) is not well stabilized thereby creating a siltation source to the Boughton River.

11.1.4 Morrison Pond

Erosion, leading to silt-loading of Black Brook, a tributary of the Boughton River, is occurring at this road-stream intersecton (Map 11L/1).

11.1.5 Grovepine Brook

Stock watering in a pasture adjacent to Grovepine Brook, a tributary of the Fortune River (Map 11L/8), has caused extensive sedimentation and very low water flows.

11.1.6 Big Brook

An abandoned shale pit constitutes a siltation source to Big Brook, a tributary of the Fortune River (Map 11L/8).

11.2 Pollution Point Sources

The entry of non-natural substances into a surface waterway is known as a pollution point source. For example, fertilizer and manure runoff into surface waterways results in bacterial and chemical contamination of the system. Inadequately or improperly treated human sewage, stormwater drainage and the discharge of industrial effluents also contribute to the deterioration of P.E.I.'s surface water quality.

The most recent examples of pollution point sources on the Island have been the entry of petroleum products, specifically gasoline, into streams, rivers and groundwater aquifers. This has resulted from either transportation accidents or leakage from underground storage tanks.

In many cases, the result of these pollution point sources is the eutrophication of the aquatic system. As is the case with siltation, the effects of many pollution point sources are felt in downstream areas. This can, for example, result in the closure of shellfish harvesting areas.

11.2.1 Primrose

Cattle grazing on a sloped pasture have access to Graystone Creek (Map 11L/7). This constitutes both a bacterial contamination and a siltation source to the creek.

11.2.2 Dingwells Mills

An asphalt plant located on the banks of the Fortune River (Map 11L/8) has the potential to spill or leach petroleum products into the river.

11.2.3 Launching Beach

A cottage development on the shore of the Boughton River represents a potential pollution point source to the estuary (Map 11L/8).

11.3 Instream Obstructions

Numerous other factors also influence the quality of waterways within the watershed. Fallen trees or other debris in the streams and rivers present problems for fish passage. Improperly installed and unmaintained culverts, insufficient water flow and inadequate or non-existent dam bypass structures not only pose barriers to successful fish passage but also affect the amount of water available for use in downstream areas by other proponents.

11.3.1 Morrison Pond I

A beaver dam on this pond (Map 11L/1) creates a complete barrier to fish passage.

11.3.2 Morrison Pond II

A 2.1 metre concrete drop inlet water control structure (Map 11L/1) poses a complete barrier to fish passage.

11.3.3 Forest Hill

The downstream section of stream prior to entering the five step pool and weir fishway (Map 11L/7) is choked with cattails and presents a barrier to fish passage.

11.3.4 MacDonalds Pond I

Insufficient water flow through a culvert (Map 11L/8) constitutes a complete barrier to fish passage on this unnamed tributary of the Fortune River.

11.3.5 MacDonalds Pond II

Beaver dams in this road-stream intersection (Map 11L/8) constitute a complete barrier to fish passage on this unnamed tributary of the Fortune River.

11.3.6 Johnny Belinda Pond

Insufficient water depth of less than 0.15 metres through a road-stream intersection (Map 11L/8) constitutes a complete

barrier to fish passage through this section of the main branch of the Fortune River.

11.3.7 Bridgetown

An abandoned saw mill operation, located near Bridgetown (Map 11L/7), creates an obstruction to the upstream passage of fish on the Boughton River. The road-stream crossing, which is constructed of wood, has a spillway lacking in depth and a jump of greater than 1.0 metre to the upstream pond.

A large sawdust pile located directly on the edge of the pond is washed into the pond during periods of high water.

REFERENCES

Aitken, A., Department of Fisheries and Oceans, Charlottetown, written comm., 1989.

Canadian Wildlife Service, Wetlands Atlas of Prince Edward Island, n.d.

Clough, K., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Curley, K., Air and Solid Wastes Branch, P.E.I. Department of the Environment, Charlottetown, pers. comm., 1989.

Curley, K., Air and Solid Wastes Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Dibblee, R., Biologist, Fish and Wildlife Branch, P.E.I. Department of the Environment, Charlottetown, pers. comm., 1989.

The Guardian - Patriot, September 1, 1988.

Horne, F., S. Knudson, A. Rice, and C. Roumbanis, 1988 Scenic Heritage Roads Program - Final Report, Island Nature Trust, Charlottetown, 1988.

MacIntyre, G., Conservation Officer, Fish and Wildlife Branch, P.E.I. Department of the Environment, Charlottetown, pers. comm., 1989.

MacKinnon, S., Fisheries Officer, Department of Fisheries and Oceans, Souris, P.E.I., pers. comm., 1989.

Mills, J., Municipal Administrator for Annandale-Little Pond-Howe Bay, P.E.I., pers. comm., 1989.

Murphy, C., Environmental Management Branch, P.E.I. Department of the Environment, Charlottetown, pers. comm., 1989.

Murphy, L., Department of Fisheries and Oceans, Charlottetown, written comm., 1989.

Murphy, S., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

P.E.I. Department of Tourism and Parks, Angling on Prince Edward Island, 1988.

P.E.I. Department of Tourism and Parks, Canoeing in Prince Edward Island, n.d.

Pharo, C., Agriculture Canada, Charlottetown, pers. comm., 1989.

Small, D., Department of Fisheries and Oceans, Ellerslie, P.E.I., pers. comm., 1988.

Sutherland, D., Agricultural Representative, P.E.I. Department of Agriculture, Souris, P.E.I., pers. comm., 1989.

Taylor, K., Inland Waters Directorate, Environment Canada, Dartmouth, N.S., pers. comm., 1988.

Water Resources Branch, P.E.I. Department of Community and Cultural Affairs, Prince Edward Island Active and Abandoned Waste Disposal Site Survey - Phase I, Charlottetown, 1983.

APPENDIX

APPENDIX A

BOUGHTON - FORTUNE RIVER WATERSHED COMPLEX - DAM INSPECTIONS

Location	Condition/Remarks	UTM Coordinates
Morrison Pond I	Beaver dam with large pond downstream. Complete barrier to fish passage.	542500 - 5121700
Morrison Pond II	0.90 metre culvert - not a barrier. Bank erosion evident.	542400 - 5121700
Big Run	Large pond with a small outlet draining to a large marshy area on the Boughton. Should not pose a barrier.	540800 - 5124800
Unnamed Pond	Dugout pond (drained), no feeder streams.	538000 - 5127600
Smelt Creek	Small stream - not good fish habitat as it is near head waters.	537800 - 5128200
Bridgetovn	Old sav mill - stream crossing forms a barrier to fish passage.	535800 - 5129100
Upton	Breached - no barrier to fish.	536100 - 5131800
Whitlocks Pond	Breached - barrier to fish due to shallov water level - outlet from Whitlocks Pond.	536200 - 5132000
Forest Hill	5-step pool and veir - complete barrier to eels (observed while at site).	536200 - 5134100
Morrison Pond III	2.1 metre drop inlet (concrete) poses complete barrier to fish.	542200 - 5121600
MacDonalds Pond I	Culvert under Hvy. 4 has lov water flov and probably could not pass fish.	541200 - 5132300
Albion Cross	Residential pond. Downstream sections do not appear sufficient to support fish.	539300 - 5131300
MacDonalds Pond II	Beaver have built a dam and blocked culbert under Hvy. 4 resulting in two total blockages.	541200 - 5132600

Location	Condition/Remarks	UTM Coordinates
Johnny Belinda Pond I	4 x 30 metre steel culvert with plank floor under Hwy. 2. Water depth of less than 0.15 metres could block fish passage.	542700 - 5139900
Johnny Belinda Pond II	(Couldn't locate.)	542900 - 5134500
St. Charles	7-step pool and veir fishway.	542300 - 5136300
Big Brook	Checked. No dam or impoundment was found.	543500 - 5132300